# Analysis of Standards Needs for Automated Metrology

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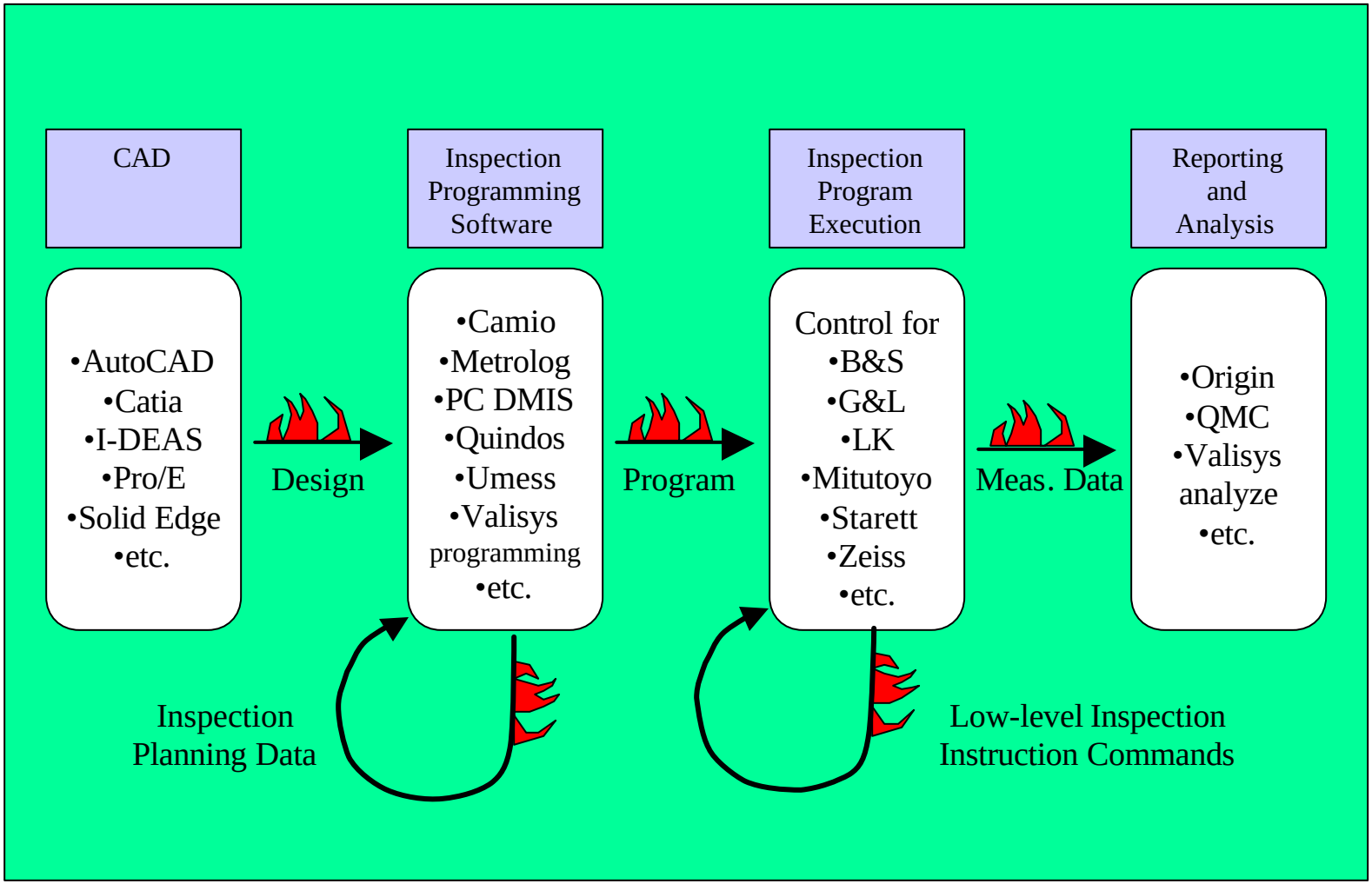
# Outline

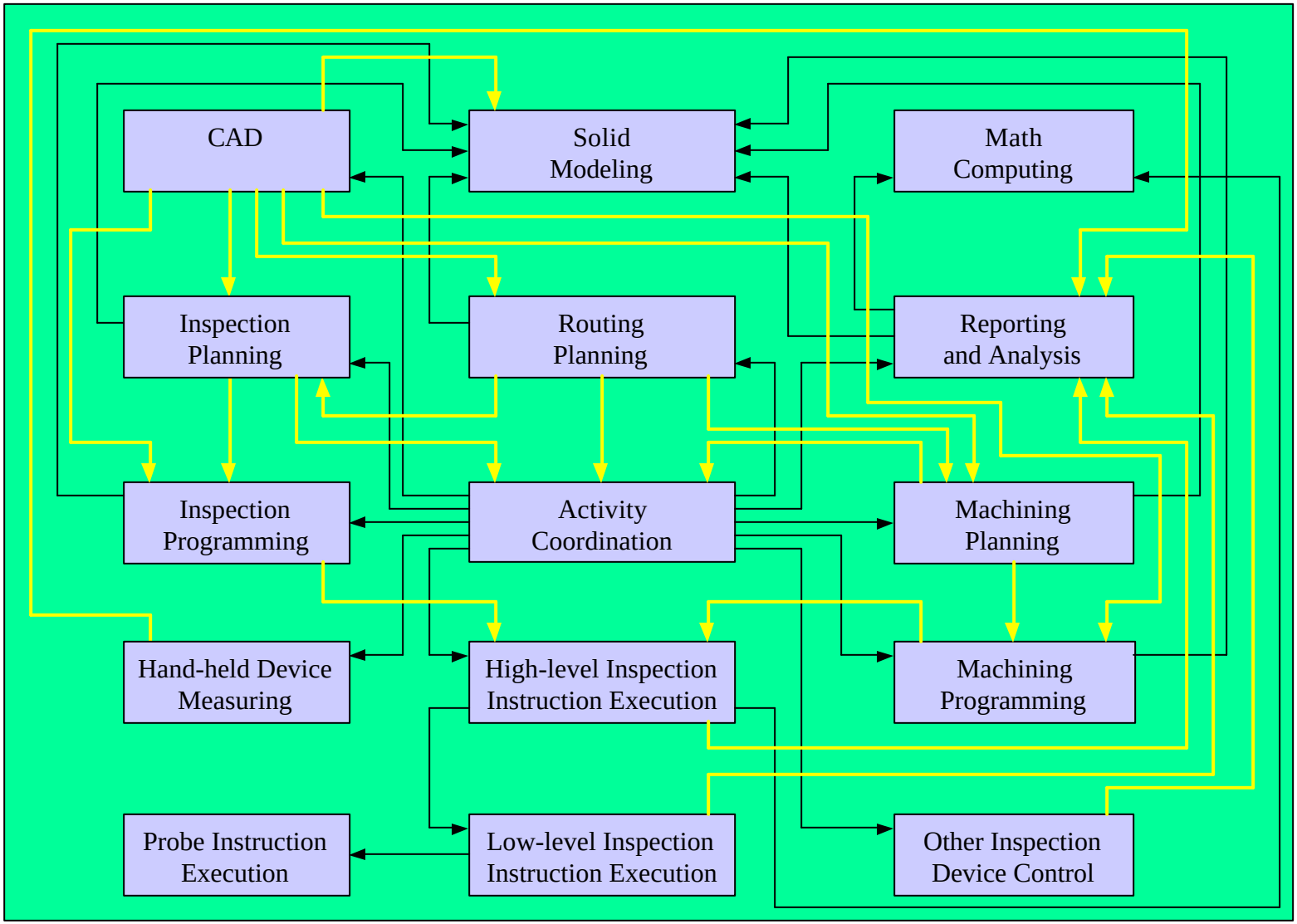
- Overview of analysis
- Major systems diagram, all modules diagram
- Major recommendations
  -- design data
  -- inspection programs
  -- measurement data
  -- inspection planning data
  -- low-level inspection instruction commands
  -- avoid duplication of effort

# Overview of Analysis

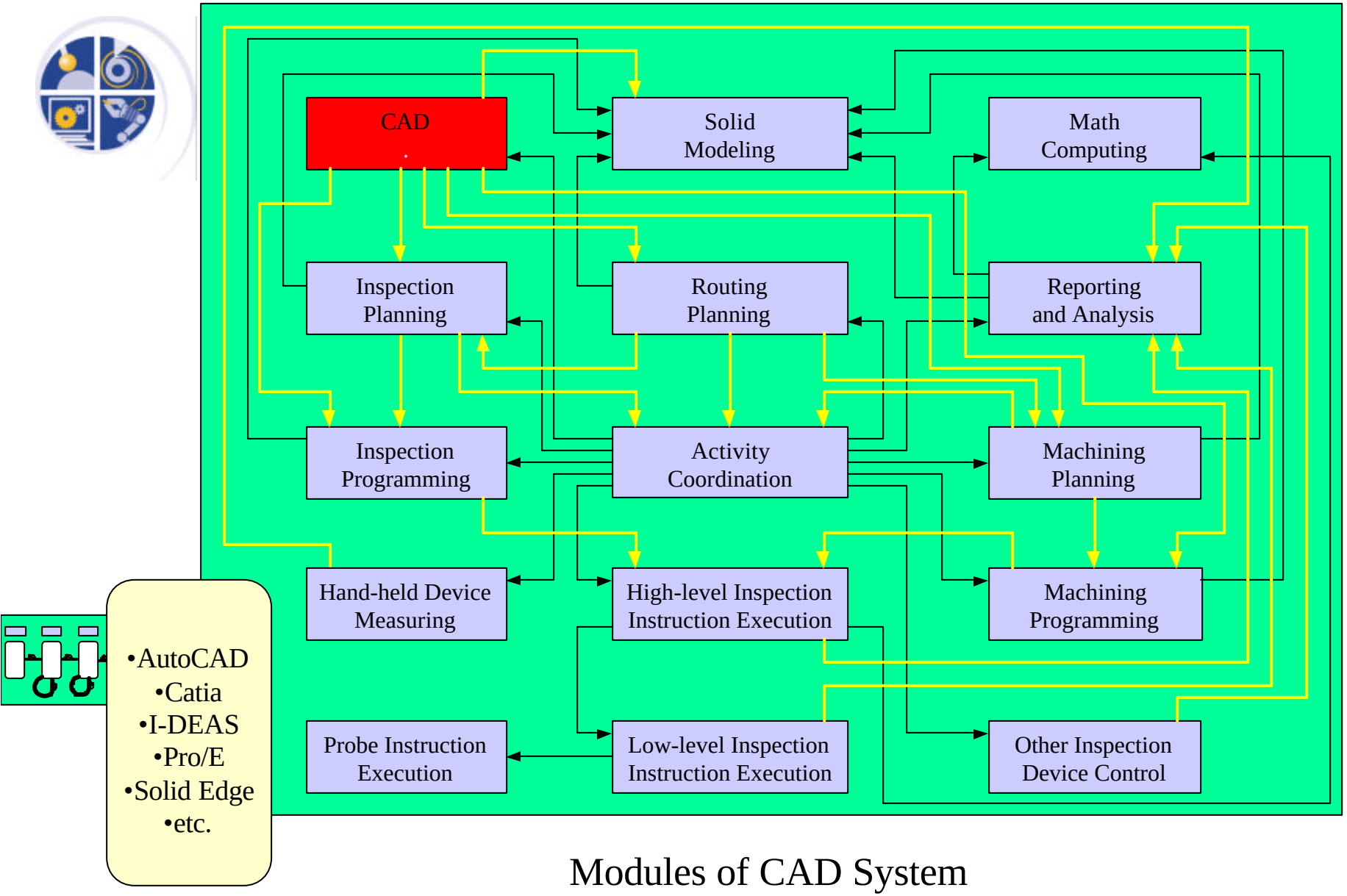
- Clean draft (68 pages) circulated for comment.
- Sec. 1 - executive summary
- Sec. 2 - focus, purpose, and scope of analysis
- Sec. 3 - 15 activities identified, plus their interfaces
- Sec. 4 - 4 major systems identified
- Sec. 5 - languages for writing standards discussed
- Sec. 6 - 22 APIs and data formats discussed
- Appendix A - modules and interfaces in detail



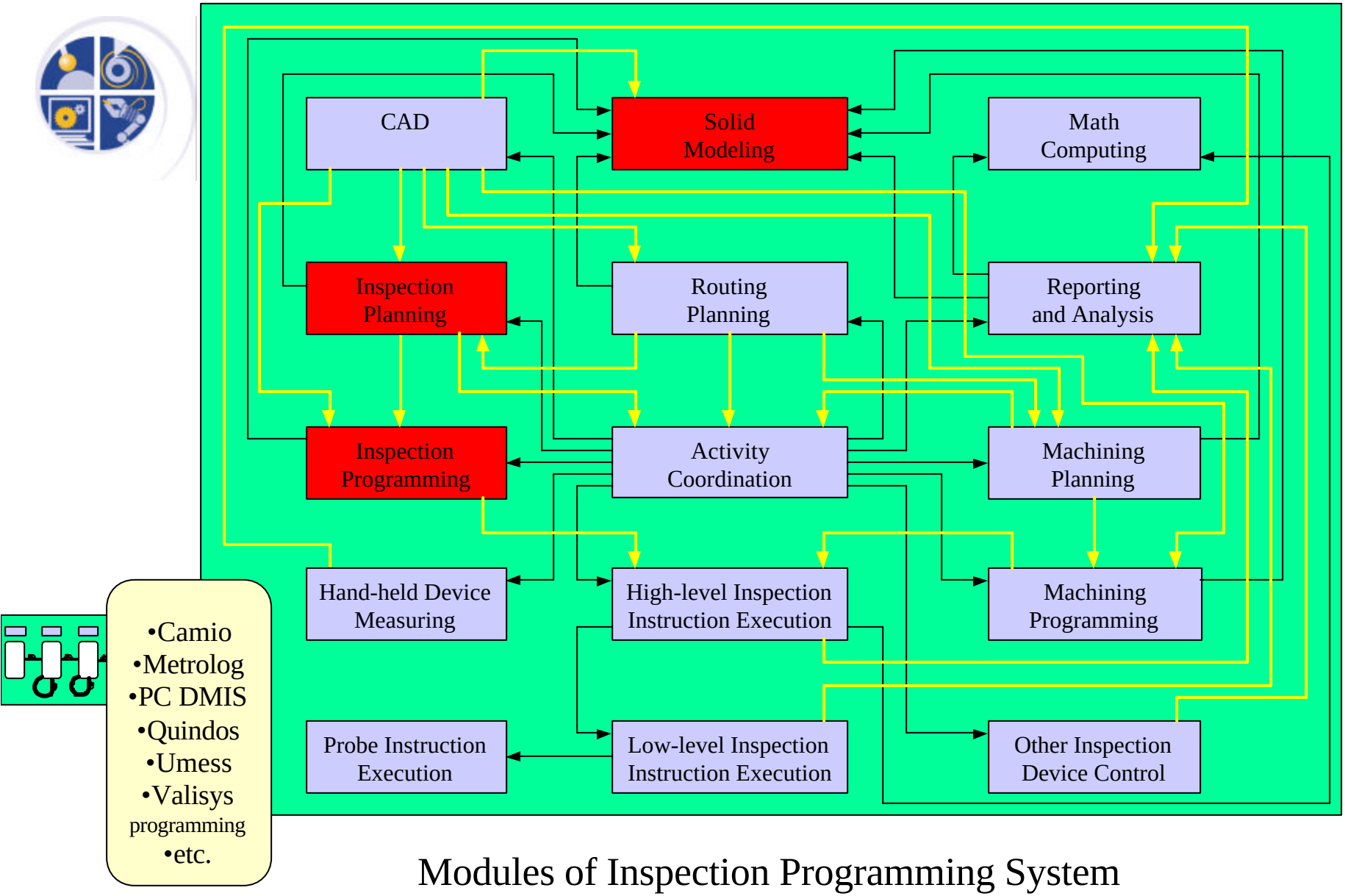

Metrology Automation Major Systems and Hot Interfaces




Modules and Interfaces in a Dimensional Metrology System
active interfaces shown in black, data interfaces in yellow

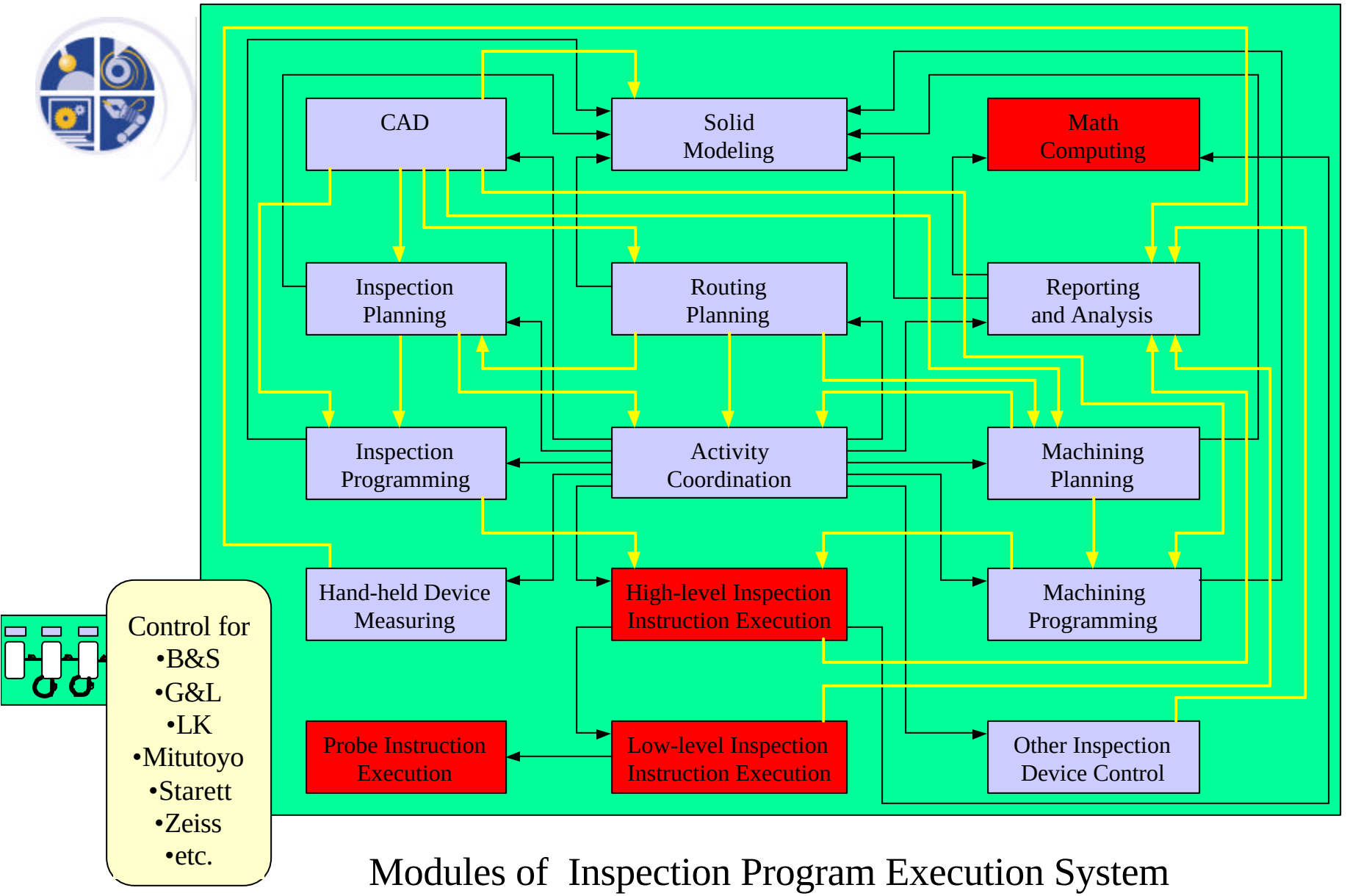



Modules of CAD System

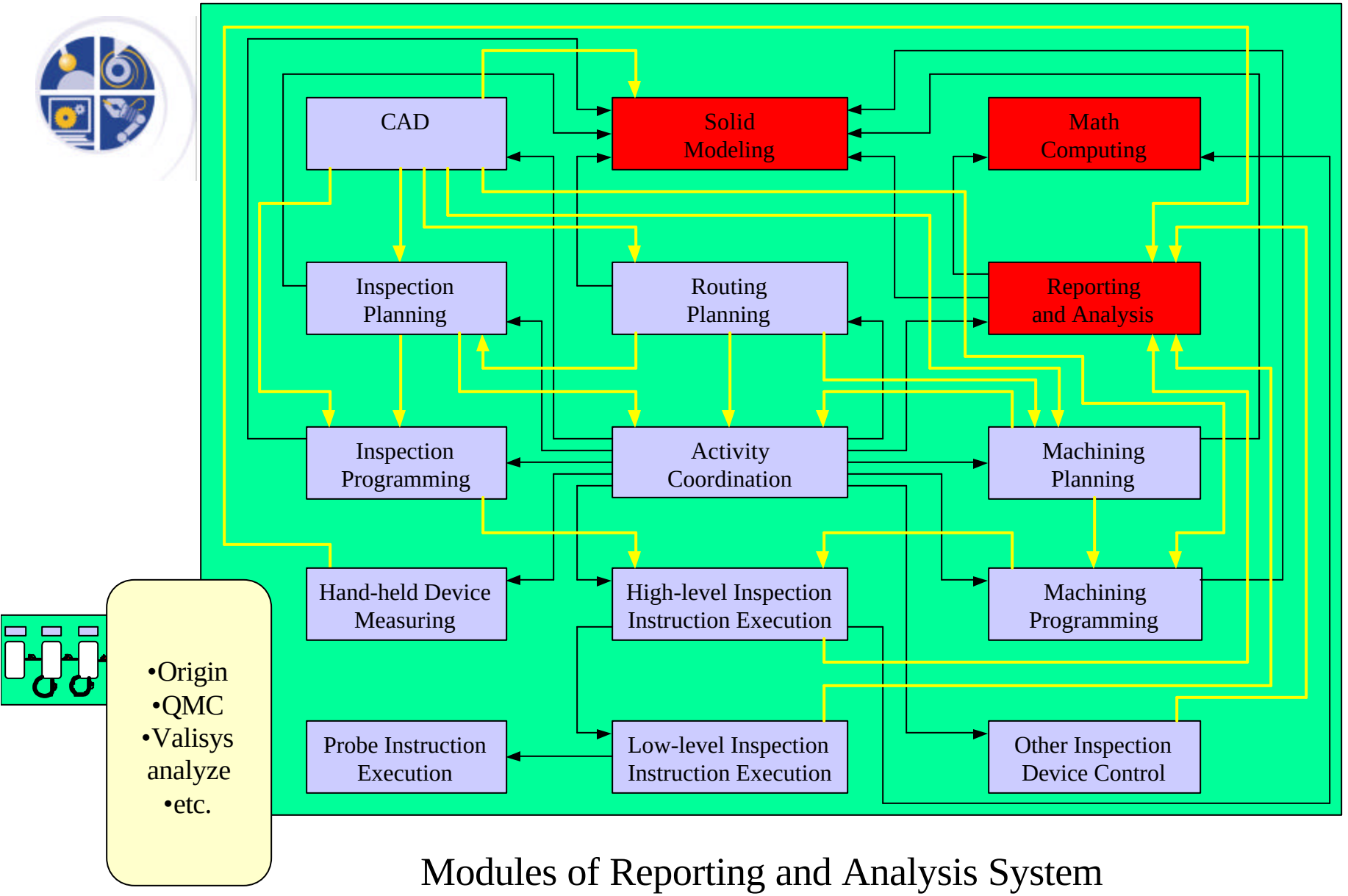



- Camio
- Metrolog
- PC DMIS
- Quindos
- Umess
- Valisys programming
- etc.

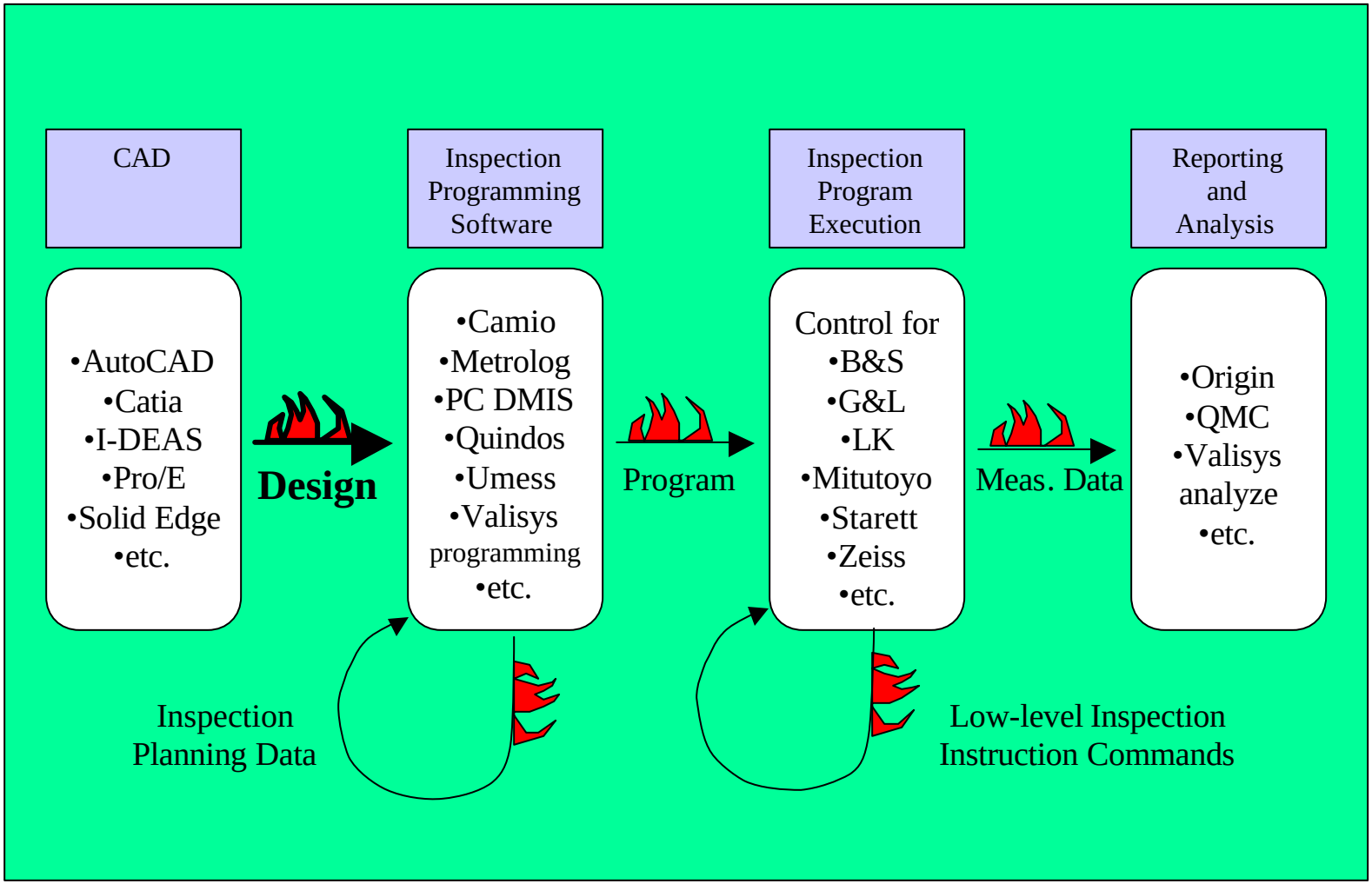
Modules of Inspection Programming System



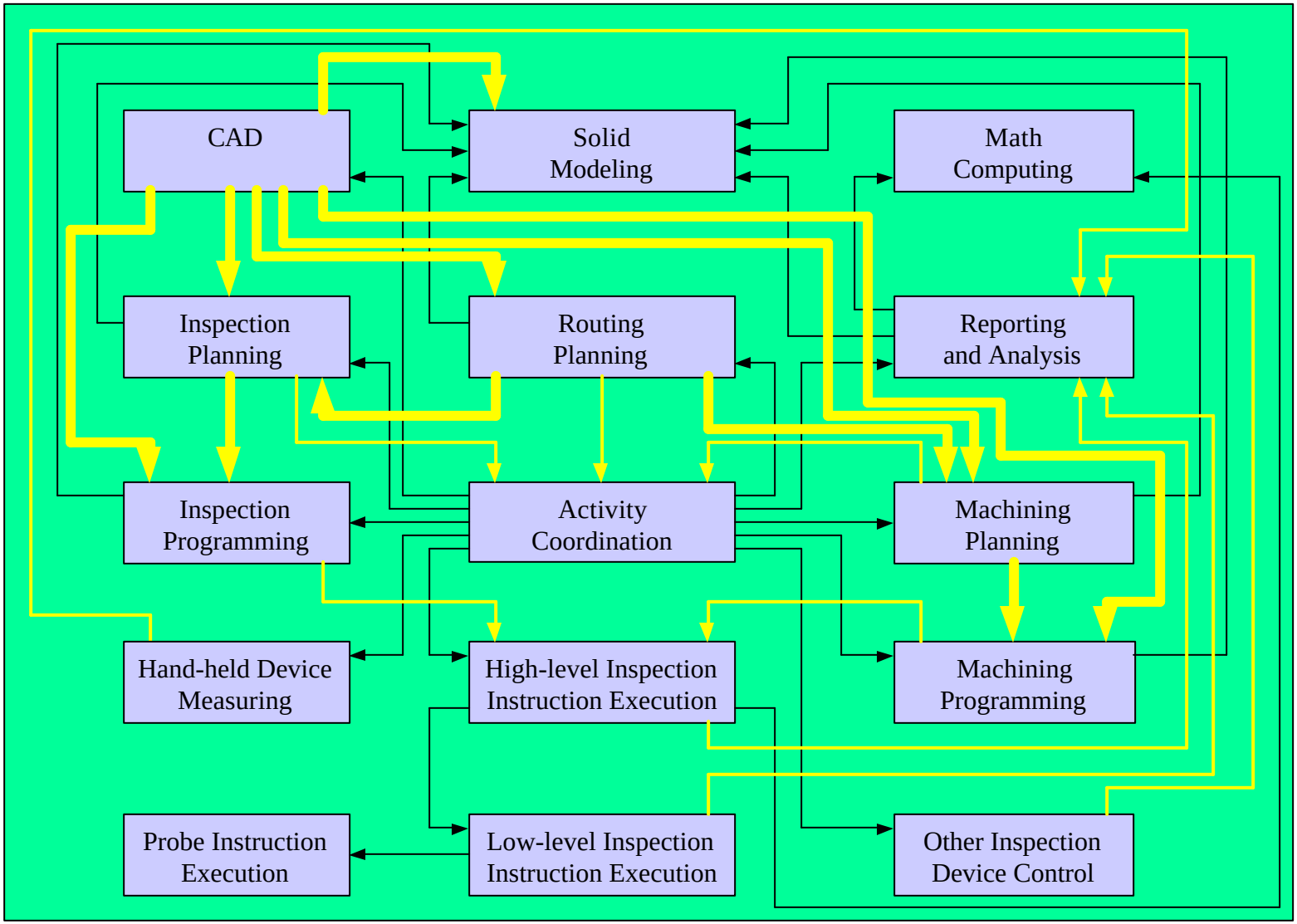

Modules of Inspection Program Execution System




Modules of Reporting and Analysis System




Systems - Design Data



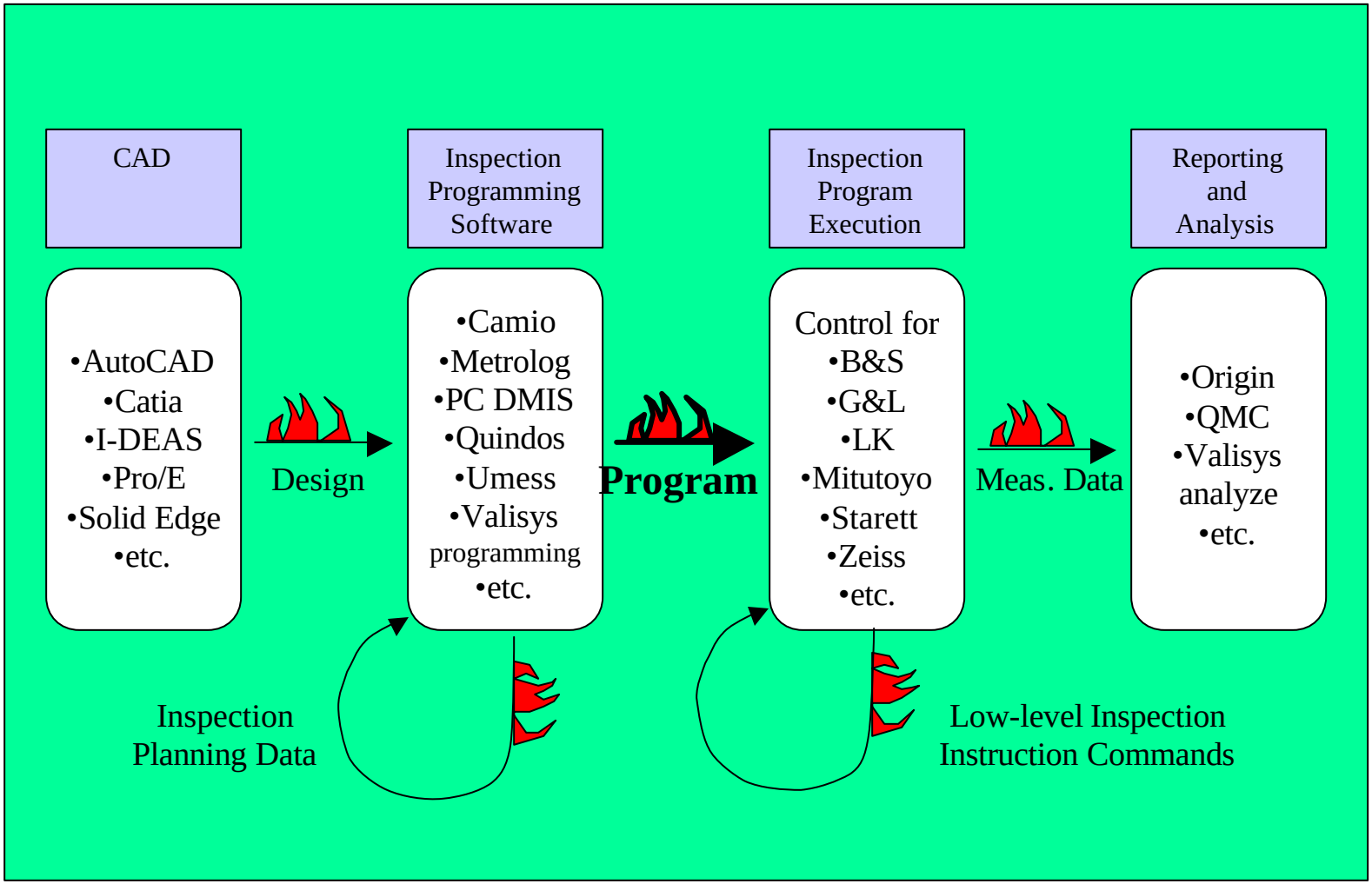

Modules - Design Data

# Design Data

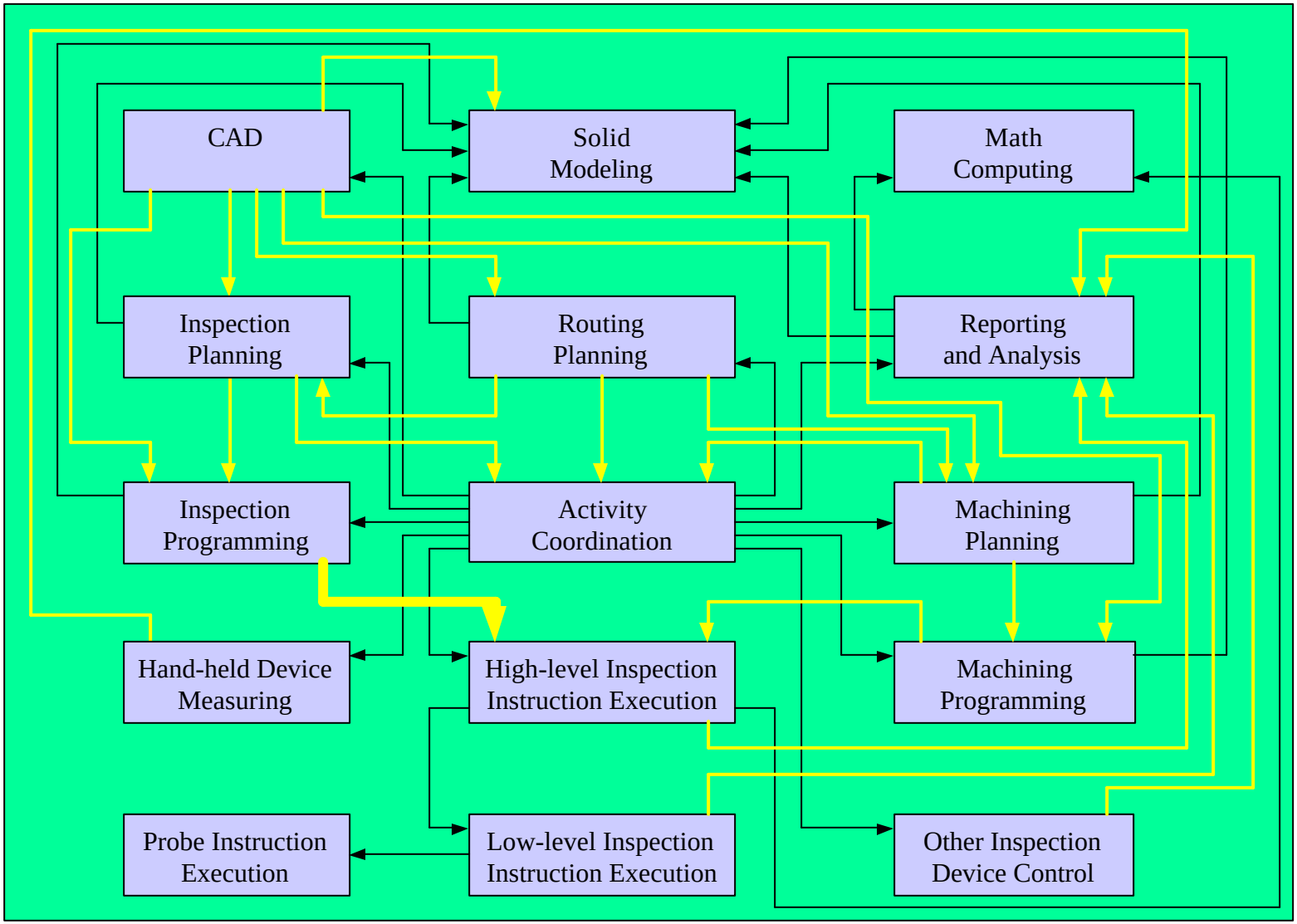
- Finished part shapes are output from CAD system.
- Intermediate workpiece shapes and feature shapes are output from Routing Planning, Inspection Planning, and Machining Planning modules.
- Many different proprietary formats exist.
- Dimensional metrology applications need tolerance items (tolerances, datums, etc.) modeled in CAD data, not just given as annotations.

# Design Data (cont.)

- STEP AP 203 (boundary representation) is only design data standard representation supported by all CAD systems but does not model tolerance items.
- STEP AP 224 (feature representation) models tolerance items but is not supported by CAD systems.
- Draft recommendation: Build a new version of STEP AP 203 that models tolerance items.




Systems - High-level Inspection Instruction Data



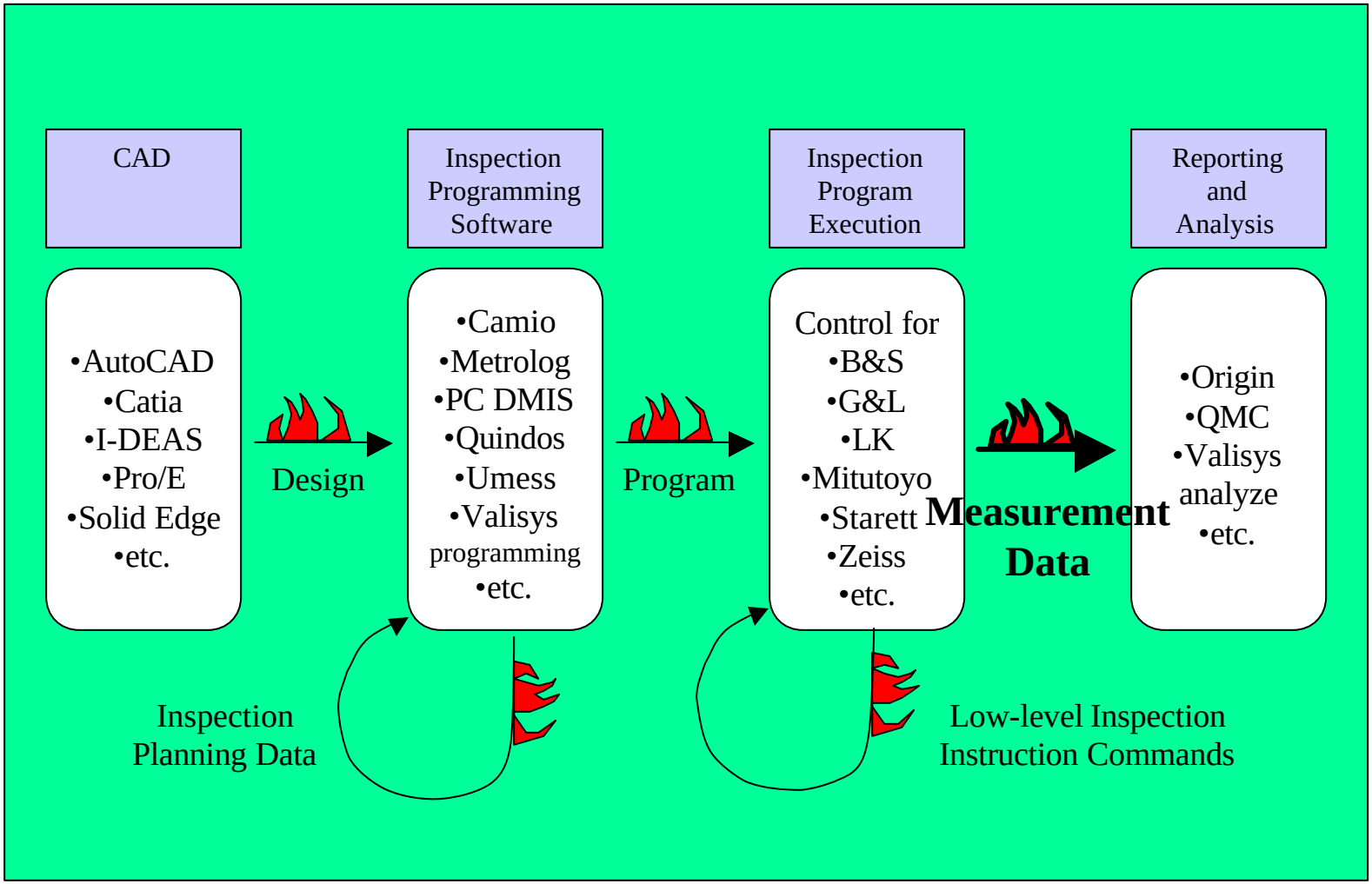

Modules - High-level Inspection Instruction Data

# Program Data

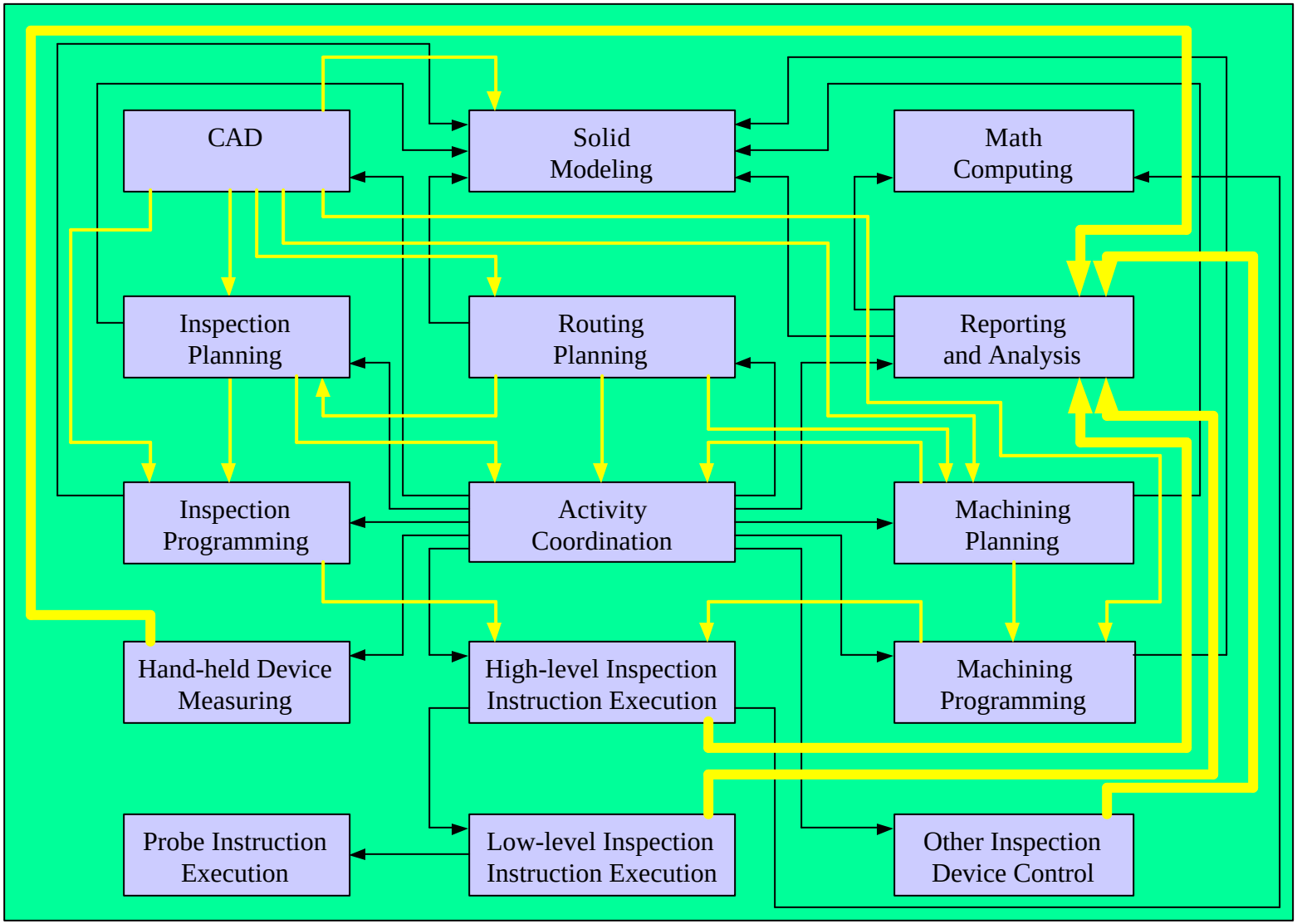
- Program Data = High-level Inspection Instruction Data
- Many proprietary languages exist.
- DMIS is the only standard language.
- DNSC has done excellent work in developing and maintaining the standard.
- Additional infrastructure is needed to support DMIS
  -- fixed conformance classes
  -- formal conformance tests
  -- conformance testing service

# Program Data (cont.)

- Draft recommendation: Solidify position of DMIS as the one and only standard for inspection programs.
- Draft recommendation: Complete standardization of DMIS Part 2.
- Draft recommendation: Harmonize AP 219 and DMIS.



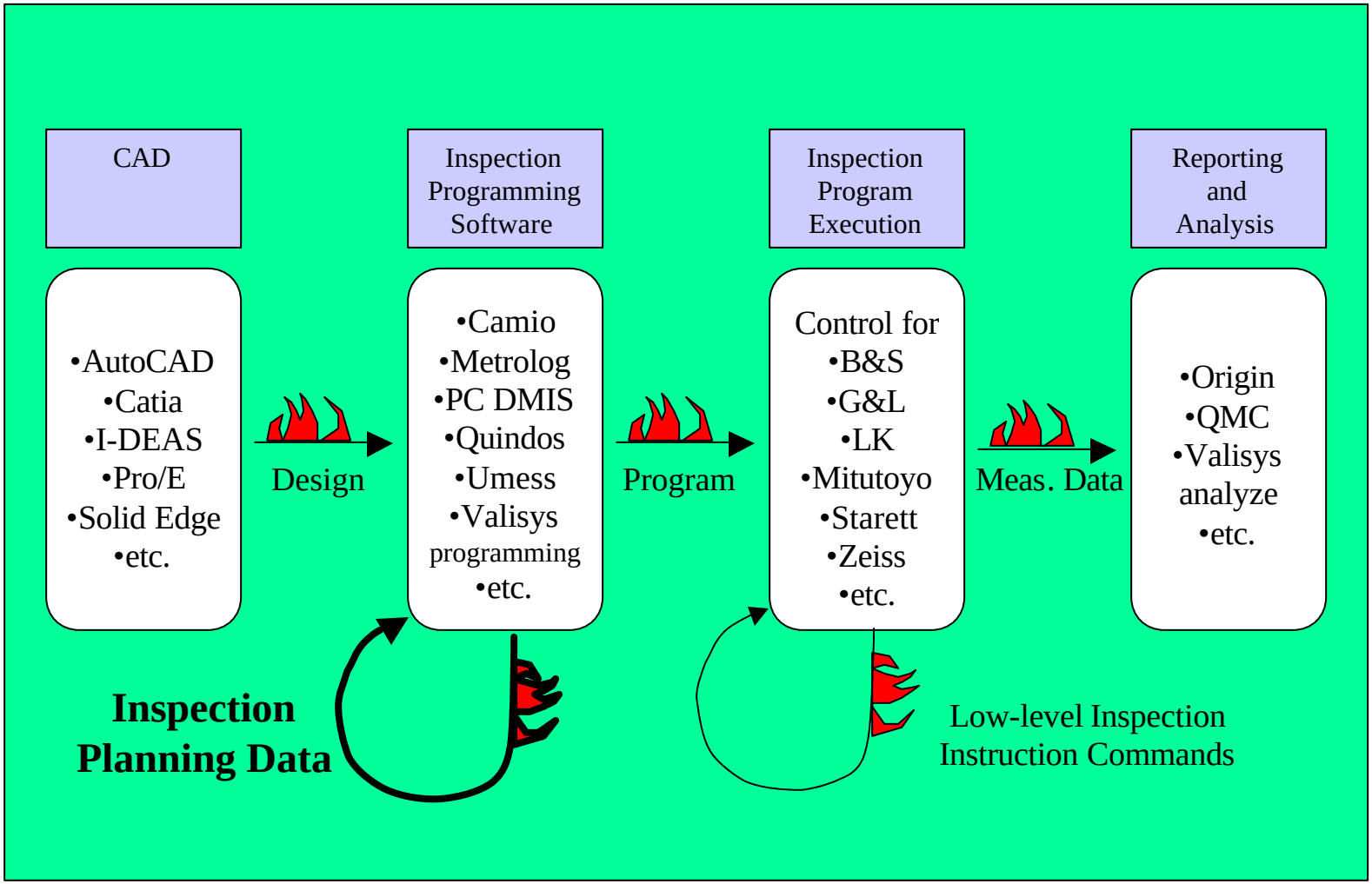

Systems - Measurement Data



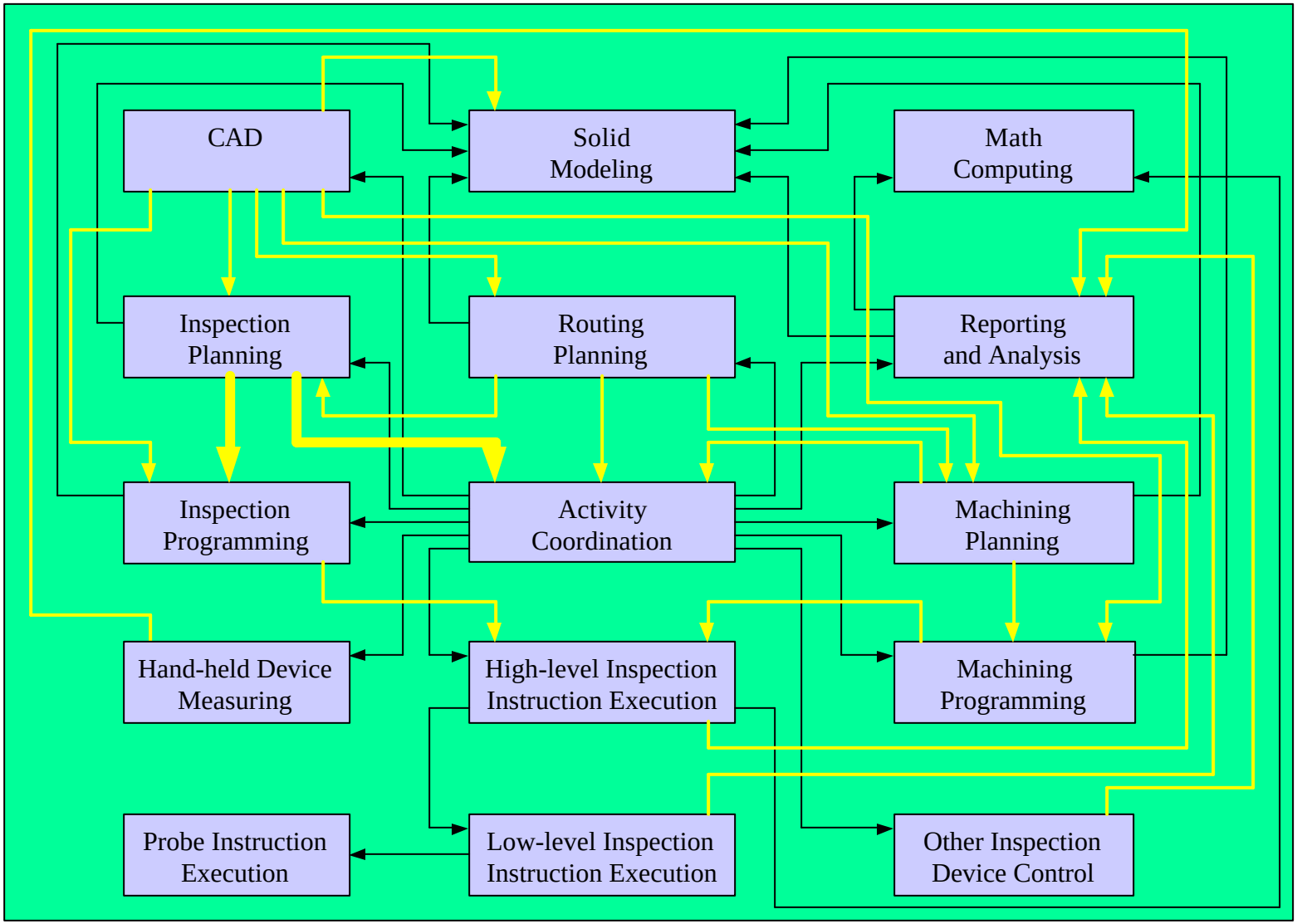

Modules - Measurement Data

# Measurement Data

- Measurement data feeds into Reporting and Analysis from various sources.
- Measurement data of the same type from different sources should be in the same format.
- A DMIS output format standard exists but is not widely used.
- Draft recommendation: Work towards a standard representation for measurement data which is input to Reporting and Analysis.



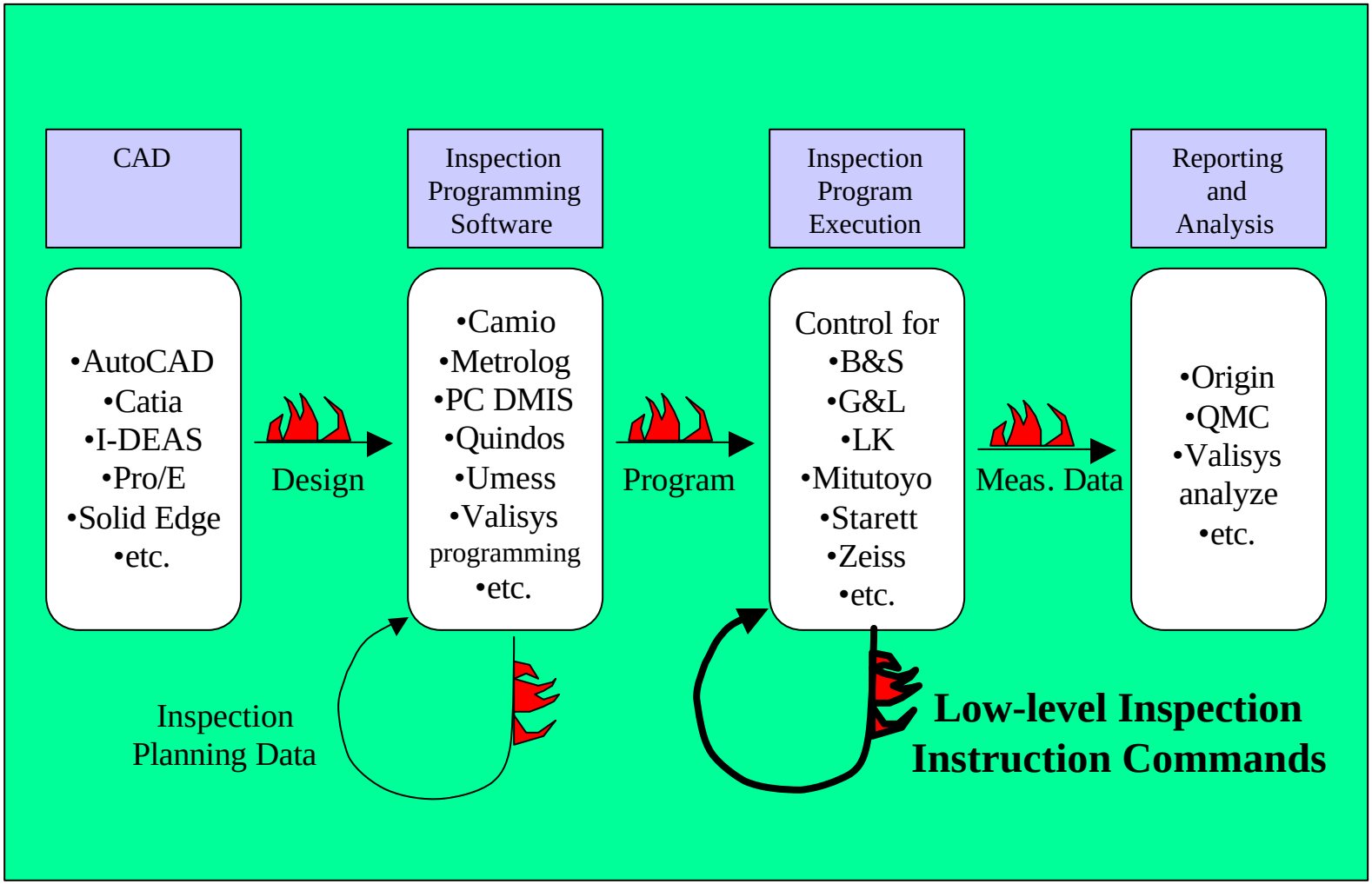

Systems - Inspection Planning Data



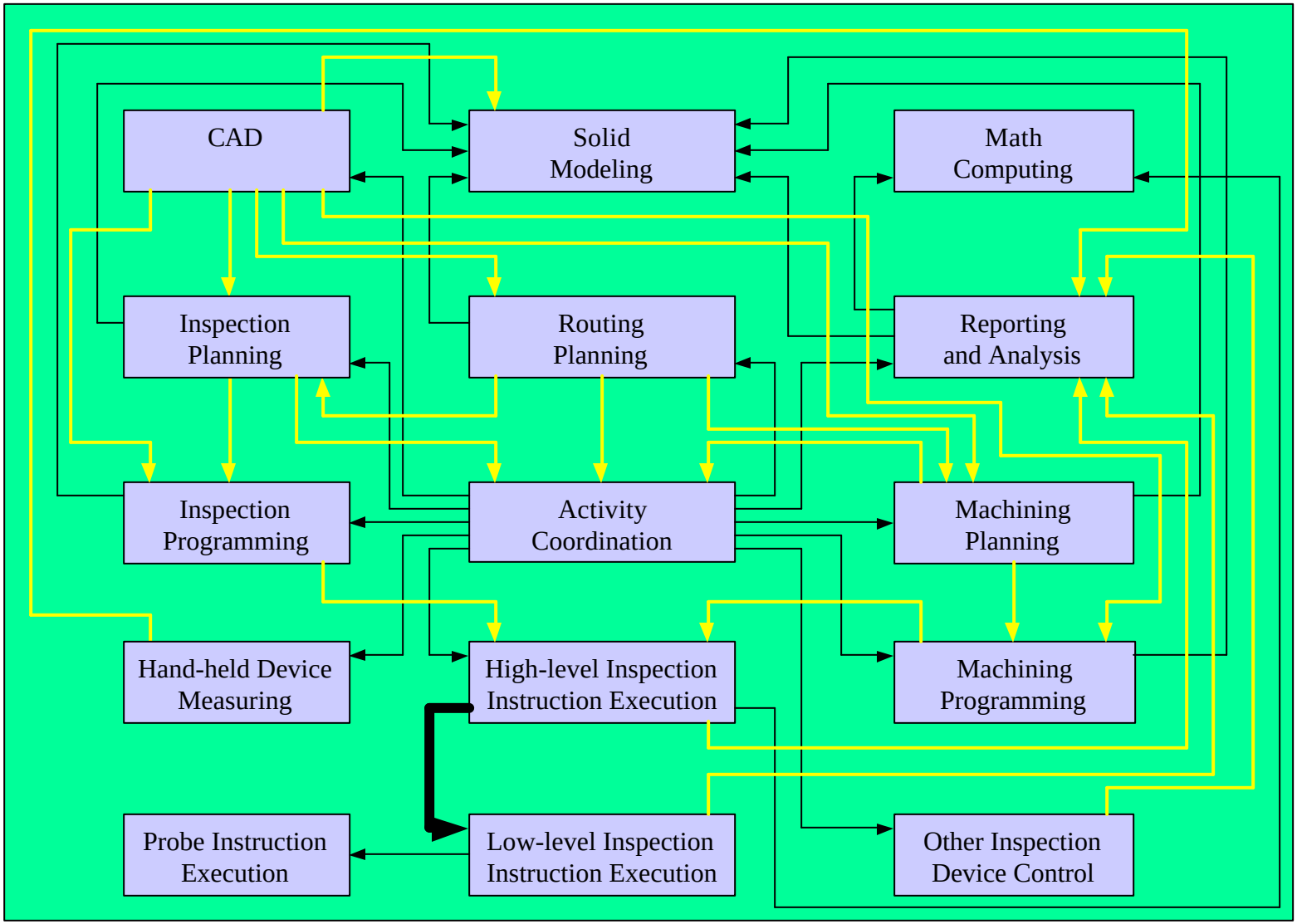

Modules - Inspection Planning Data

# Inspection Planning Data

- No standard or widely used format for inspection planning data exists, but one is needed.
- STEP AP 219 is working towards such a standard.
- Draft recommendation: Continue development of STEP AP 219.
- Draft recommendation: Harmonize AP 219 and DMIS.




Systems - Low-level Inspection Intstruction Commands




Modules - Low-level Instruction Execution Commands

# Low-Level Inspection Instruction Commands

- Many proprietary APIs exist.
- Three standards development efforts in progress:
  -- CMM-Driver Commands
  -- DMIS Part 2 DmeEQUIP
  -- I++
- This standard will be useful to system builders.
- Draft recommendation: Continue work on CMM-Driver Command standard.
- Draft recommendation: Harmonize current efforts.

# Avoid Duplication of Effort!

- Draft recommendation: Avoid multiple standards for the same purpose; their existence is costly.
- Draft recommendation: Where there is overlap, harmonize.
- Draft recommendation: Harmonize AP 219 and DMIS.
- Draft recommendation: Forestall multiple standards for low-level inspection instruction commands.

# Questions and Discussion